

LEE - 10/733,276

Client/Matter: 040044-0307078

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Cancelled).
2. (Currently Amended) The method of claim 4 ~~1~~, wherein the first conductive line is formed of copper.
3. (Cancelled).
4. (Original) A method of manufacturing a semiconductor device, comprising:

forming a first insulating layer on a semiconductor substrate;

forming a first conductive line by depositing a conductive material on the first insulating layer and selectively patterning the conductive material;

forming a second insulating layer by depositing an insulating material on top of the substrate including on the first conductive line;

forming a via hole by selectively patterning the second insulating layer in order to expose a certain portion of the first conductive line; and

removing a natural oxide layer, formed on the first conductive line through natural oxidation of the first conductive line, by heat treating in an H₂+CO gas atmosphere.
5. (Original) The method of claim 4, wherein the heat treatment is performed at room temperature to 200° C.
6. (Cancelled).
7. (Cancelled).
8. (Original) A method of manufacturing a semiconductor device, comprising:

forming a first insulating layer on a semiconductor substrate;

LEE -- 10/733,276
Client/Matter: 040044-0307078

forming a first conductive line by depositing a conductive material on the first insulating layer and selectively patterning the conductive material;

forming a second insulating layer by depositing an insulating material on top of the substrate including on the first conductive line;

forming a via hole and a trench by selectively patterning the second insulating layer to expose a certain portion of the first conductive line;

forming a metal barrier by depositing a metal layer on top of the substrate including in the via hole and on the trench;

forming a copper seed layer on top of the metal barrier; and

removing a natural copper oxide layer, formed on the copper seed layer through natural oxidation of the copper oxide layer, by heat treating in an H_2+CO gas atmosphere.

9. (Original) The method of claim 8, wherein the heat treatment is performed at room temperature to 200° C.

10. (Cancelled).

11. (Currently Amended) The method of claim ~~13~~ 10, wherein the second conductive line is formed of copper.

12. (Cancelled).

13. (Original) A method of manufacturing a semiconductor device, comprising:

forming a first insulating layer on a semiconductor substrate;

forming a first conductive line by depositing a conductive material on the first insulating layer and selectively patterning the conductive material;

forming a second insulating layer by depositing an insulating material on top of the substrate including on the first conductive line;

forming a via hole and a trench by selectively patterning the second insulating layer to expose a certain portion of the first conductive line;

LEE — 10/733,276
Client/Matter: 040044-0307078

forming a metal barrier by depositing a metal layer on top of the substrate including in the via hole and on the trench;

depositing a conductive material for forming a conductive line on top of the substrate including on the metal barrier to sufficiently fill the via hole and the trench;

forming a plug and a second conductive line by planarizing the conductive material on the second insulating layer in order to expose the second insulating layer; and

removing a natural oxide layer, formed on the second conductive line through natural oxidation of the second conductive line, by heat treating in an H_2+CO gas atmosphere.

14. (Original) The method of claim 13, wherein the heat treatment is performed at room temperature to 200° C.